Evaluation of a Technology to Support a Translational Diabetes Prevention Intervention

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Diabetes is now one of the greatest threats to our public health. There are now over 26 million Americans with diabetes, which exert considerable social and fiscal impact (1). More disturbingly, there are now more than 86 million people in the U.S. with prediabetes, a metabolic condition that significantly increases risk for developing type 2 diabetes (1,2). Fortunately, there is now substantial evidence that this risk can be significantly reduced by lifestyle interventions that result in modest reductions in weight and increased physical activity (3,4). Thus, there have been increasing efforts to translate these interventions into programs that can be more readily accessed by the public, and there is growing evidence that many are effective in producing weight loss that is associated with risk reduction (5). Unfortunately, many people, particularly low-income and minority populations, find it difficult to commit to a weight-loss intervention that requires structured attendance at specific venues (5,6). This has given rise to investigators trying new approaches for diabetes prevention, including the application of mobile technology, which is the basis of the study reported by Fischer et al. (7) in this issue of *Diabetes Care*.

The Diabetes Prevention Program (DPP), a multicenter study of strategies to prevent type 2 diabetes in high-risk individuals, demonstrated that modest weight loss (5–7% reduction from baseline) and increased physical activity (the equivalent of brisk walking for 150 min per week) can reduce the risk of developing type 2 diabetes by 58% (4). This study established that weight loss is the primary mechanism for reducing risk (7). Many people, however, find it difficult to lose weight without support. Thus, a variety of approaches have been developed. Many programs are limited, however, by the demand placed on the participants to participate in terms of both cost and access to a scheduled program offered at a specific location. This is particularly true for low-income populations (5,8). As a result, greater attention has been given to developing weight-loss programs in general and diabetes prevention programs in particular that use mobile technologies to increase both access and flexibility (9,10). Moreover, advances in technology have made cell phones less expensive and more accessible to the poor (11).

Fischer et al. (7) report the results of a randomized, comparative effectiveness trial that used text messaging using cell phones to support a diabetes prevention intervention that was modeled after the successful curriculum used in the DPP in a federally qualified health center. They hypothesized that text message support (intervention) would lead to greater weight loss in participants with prediabetes than an invitation to DPP classes alone (control). The text messages reflected a number of categories used in the DPP intervention: keeping a diary and tracking calories or fat grams consumed, problem-solving, motivation, and stress reduction. They also provided specific recipes, activity promotion messages, and web links for additional resources to assist the user in achieving weight loss. The participants received six messages per week (in English or Spanish) relating to nutrition, physical activity, and motivation. In addition, they received a weekly text message asking participants to report their most recent weight. Intervention participants were also eligible for individual motivational interviewing appointments with a health coach, generally by telephone. The primary outcome was change in mean weight. Secondary outcomes were percent of participants with at least 3% and 5% weight loss, change in mean HbA_{1c}, change in mean systolic blood pressure, and operating costs per participant receiving the intervention. Outcome measures were collected at baseline and 6 and 12 months.

The results showed that intervention subjects lost significantly more weight (−2.6 lbs in intervention subjects vs. −0.56 lbs in control subjects, $P = 0.05$) and a greater percentage reached the target 3% weight loss (38.5% of the intervention subjects vs. 21.5% of the control subjects, $P = 0.02$) than control

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subjects. In addition, changes in mean HbA_{1c} were not significant between groups. HbA_{1c} was more likely to increase in control subjects and to decrease in the intervention participants, but this observation was not statistically significant. The change in mean HbA_{1c} was 0.19% or 2.1 mmol/mol (95% CI −0.1 to 0.5) for the control group participants and −0.09% or −1.0 mmol/mol (95% CI −0.2 to 0.0) for the intervention participants (absolute difference 0.28% or 3.1 mmol/mol, $P = 0.07$). Finally, language demonstrated a significant treatment effect in Spanish speakers but not in English speakers.

Interestingly, Fischer et al. (7) have focused on a unique population that certainly needs support to help them reduce their risk for developing type 2 diabetes, i.e., low-income individuals, many who are Spanish speakers, treated at a federally qualified health center. They used a technology that has great potential to improve program uptake in this cohort. There are, however, limitations to this study that caution interpretation of the results. The sample size was modest. Also, several of the participants reported engaging in other weight-loss activities outside of the study. Finally, it was not possible to determine if all the intervention participants received all of the intended text messages. This makes it impossible to determine if there is a dose effect. It is also not clear if the intervention would be used if the participants had to pay any of the costs (albeit quite low) that were associated with the implementation of the text messages. Clearly, additional studies need to be conducted to better understand how text messaging can best be used to support diabetes prevention. This study does add, however, to the text message literature as it addresses the prediabetes population in a safety net institution, has longer-term follow-up than other published interventions, and uses a randomized, controlled design with an intention-to-treat analysis.

Given the magnitude of the problem of prediabetes, new approaches to support weight-loss support are needed, especially when considering the growing barriers of cost and access. In spite of the limitations noted, the study by Fischer et al. (7) shows promise for a novel modality to help safety net patients with prediabetes lose weight. Clearly, this study suggests that text message support can lead to greater weight loss in Spanish speakers compared with English speakers, a group that is disproportionately burdened by both obesity and diabetes. It also reinforces a growing literature that has demonstrated the potential benefits of text messaging in improving chronic health conditions.

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References

1. Centers for Disease Control and Prevention. *Diabetes Report Card 2015*. Atlanta, GA, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, 2015
2. Nichols GA, Hillier TA, Brown JB. Progression from newly acquired impaired fasting glusose to type 2 diabetes. Diabetes Care 2007;30:228–233
3. Tuomilehto J, Lindström J, Eriksson JG, et al.; Finnish Diabetes Prevention Study Group. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001;344:1343–1350
4. Knowler WC, Barrett-Connor E, Fowler SE, et al.; Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002;346:393–403
5. Dunkley AJ, Bodicoat DH, Greaves CJ, et al. Diabetes prevention in the real world: effectiveness of pragmatic lifestyle interventions for the prevention of type 2 diabetes and of the impact of adherence to guideline recommendations: a systematic review and meta-analysis. Diabetes Care 2014;37:922–933
6. Sharifi N, Mahdavi R, Ebrahimi-Mameghani M. Perceived barriers to weight loss programs for overweight or obese women. Health Promot Perspect 2013;3:11–22
7. Fischer HH, Fischer IP, Pereira RI, et al. Text message support for weight loss in patients with prediabetes: a randomized clinical trial. Diabetes Care 2016;39:1364–1370
8. Hamman RF, Wing RR, Edelstein SL, et al. Effect of weight loss with lifestyle intervention on risk of diabetes. Diabetes Care 2006;29:2102–2107
9. Ali MK, Echouffo-Tcheugui J, Williamson DF. How effective were lifestyle interventions in real-world settings that were modeled on the Diabetes Prevention Program? Health Aff (Millwood) 2012;31:67–75
10. Cole-Lewis H, Kershaw T. Text messaging as a tool for behavior change in disease prevention and management. Epidemiol Rev 2010;32:56–69
11. Ramachandran A, Snehalatha C, Ram J, et al. Effectiveness of mobile phone messaging in prevention of type 2 diabetes by lifestyle modification in men in India: a prospective, parallel-group, randomised controlled trial. Lancet Diabetes Endocrinol 2013;1:191–198